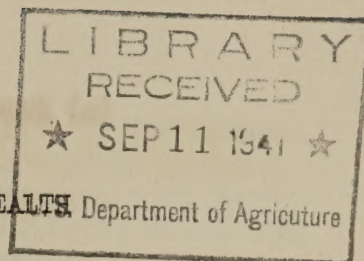


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Central States

United States Department of Agriculture  
U.S. EXTENSION SERVICE  
Washington, D. C.



WHAT IS THE SITUATION REGARDING NUTRITION AND HEALTH, Department of Agriculture  
AND WHAT SHOULD WE DO ABOUT IT? 1/

I. Quoting from a speech by Milo Perkins of the Surplus Marketing Administration, The Challenge of Underconsumption:

"Nearly two-thirds of 29 million families in the United States have incomes under \$1,500 a year. These incomes average \$826 a year, or \$69 a month for between four and five persons. One-fourth of this two-thirds spend less than 5 cents a person per meal.

With such incomes it is practically impossible for city families to provide all the nutritive essentials in sufficiently generous quantities for buoyant health at the present cost of food in cities."

Given land and labor, almost every farm family can provide itself with the foods necessary for good nutrition, if it will.

In spite of low incomes, very few people in America die of actual starvation, for in order to protect the individual in times of low food intake, Nature lowers his basal metabolic rate and thus his requirement for energy-giving food. This, however, is done at the expense of his vitality and his physical and mental efficiency.

II. What types of malnutrition do we recognize in the North Central States?

1. Physicians in these Central States seldom see really serious cases of deficiency diseases such as:

(a) Rickets - except in winter.

(b) Pellagra. Although public health authorities estimate that there are about 100,000 cases in the South, in the Central States we see well-developed pellagra usually only in hospitals for alcoholics. In the South physicians are familiar with the redness of exposed portions of the skin and the other symptoms which go along with pellagra. Many of the symptoms of pellagra are usually due to lack of several factors of the vitamin B complex, not lack of nicotinic acid exclusively.

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1/ Notes on a talk by Dr. Russell Wilder, chairman, Committee on Foods and Nutrition of the National Research Council, and head, Department of Medicine, Mayo Foundation, at the Regional Extension Conference on the Family Food Supply, Central States, at Chicago, Ill., Feb. 15, 1941.



(c) Beri-beri. In the Central States we do not often see flagrant beri-beri because we do not have so exclusively carbohydrate a diet as do the Chinese, who have need for a high intake of vitamin B<sub>1</sub> or thiamin, to burn up the great quantities of carbohydrate they eat in the form of polished rice. In America, however, carbohydrates in the form of refined grain products and sugar provide the cheapest sources of calories. They do not provide vitamin B<sub>1</sub>, which is a necessary requirement for the normal conversion of glucose to energy in the tissues.

2. Physicians do see on every hand, if they are prepared to recognize them, signs of subacute vitamin deficiency especially of the B-complex vitamins, and are coming to understand the connection between low intake of these vitamins and weakness, fatigue, mental disturbances, dilatation of the heart, edema of feet and ankles, and neuritis (pain in muscles and nerves) of which many patients complain. Under any unusual strain--such as operations, pregnancy, goiter, heavy work all day in a factory--symptoms of actual deficiency of thiamin (vitamin B<sub>1</sub>), of riboflavin (vitamin G), or of nicotinic acid, not manifest before, tend to show up.
3. The percentage of draft rejections is high enough to be discouraging. It is difficult to interpret the figures as they stand. However, there is a high percentage of rejections due to poor teeth, also to underweight. Probably most draft physicians cannot diagnose subacute conditions. If they had the opportunity to use the latest tests, they might find many more selectees showing signs of malnutrition as we are coming to understand it. It seems apparent that at least half our population is not receiving the ample and balanced food supply needed for buoyant health.

### III. Discussion of vitamin deficiencies, illustrated by slides.

#### 1. Vitamin C (ascorbic acid)--scurvy.

- a. Symptoms: Bleeding under gums, under skin and around joints, also, painful joints. Defective growth of bones and teeth in children.
- b. Scurvy is seen mostly in the North, although subacute conditions are not uncommon in the South. In parts of the South where foods can have a high content of vitamin C because of bright sunshine, the type of agriculture based on cotton and tobacco brings about near-scurvy in many people who do not have gardens or do not use or buy many vegetables and fruits. In passing, recent studies under the direction



of Dr. Sebrell of the Institute of Public Health in Washington, D. C., have shown that the amount of ascorbic acid in fruits is higher when they are picked in the sunshine than when they are picked after dusk, and that they have only about one-fourth as much ascorbic acid when grown under cheesecloth as when grown under ordinary conditions. Drake and McHenry in Toronto have shown that tomatoes grown in Canada have only around 25 percent of the amount of vitamin C found in tomatoes grown in the United States.

- c. Vitamin C enters into defense mechanisms of the body against infection. This has been shown with laboratory animals and with patients in tuberculosis hospitals. For example, tuberculous patients whose diets contain generous amounts of vitamin C almost never contract tuberculosis of the intestinal tract from swallowing their own sputum laden with tubercle bacilli.

## 2. Vitamin A.

- a. Lack of vitamin A affects the mucous membranes lining the body cavities, including the intestinal tract. It also affects the cornea of the eye. During the first World War the Danes "sold their children's eyes along with their butter." The pathologic condition of the eyes of Danish children was corrected by giving butter or cod-liver oil rich in vitamin A, if tissue deterioration had not progressed too far.
- b. Low vitamin A intake tends to produce night blindness--e.g., slow recovery after being dazzled by glare. However, individuals differ greatly in this respect. Some persons can be really depleted of vitamin A, even to the extent of showing skin conditions (like goose pimples), without developing night blindness.
- c. Sources of vitamin A: Fish-liver oils, animal livers, butter. The source of provitamin A is plant carotene, which is absorbed if we have enough fat in the diet, green and yellow vegetables, and fruits.
- d. Desirable intake level: The suggested minimum is 4,000 international units--better 6,000. There is some uncertainty about the amount required.

## 3. Vitamin B<sub>1</sub>. Discussion illustrated by slides showing effects of B<sub>1</sub>-deficient diets on human subjects.

- a. These figures are based on experiments conducted in the nutrition laboratory of a hospital in Rochester, Minn., by Dr. Ray Williams of the Mayo Foundation. Several women were given a diet adequate in all other respects, and not much lower in



vitamin B<sub>1</sub> than the amount usually obtained by people spending less than 25 cents a day for food.

- b. Slide 1 was a graph showing marked accumulation of lactic acid in the blood during exercise, in subjects on low B<sub>1</sub> intake, contrasted with much smaller accumulations for the same work when thiamin intake was progressively increased. Blood-sugar (dextrose) is attacked by a series of enzymes and split into intermediary products in successive stages of oxidation, until it finally becomes CO<sub>2</sub> and H<sub>2</sub>O. Liberation of its energy results. Lactic acid is one of the stages in the oxidation of glucose.
- c. Another slide showed changes in dextrose tolerance. When there is plenty of B<sub>1</sub> in the diet, blood-sugar (dextrose) rises moderately after meals and then promptly falls. With low thiamin intake, the level of dextrose rises higher and falls much more slowly. The picture is like that of the diabetic patient but the abnormality does not represent true diabetes.
- d. Electrocardiac changes (slides).
  - (1) After several weeks on the diet, the subjects were tired, didn't take interest, expressed vague fears, didn't feel like working, and finally their appetites failed.
  - (2) On testing the electrocardiac reactions of muscles of the heart, disturbances of heart muscle action were shown. Curves like these are often seen in electrocardiograms, and many cardiologists consider them normal variations. However, when the B<sub>1</sub> intake was increased and its level in the blood was gradually raised, the variations regularly disappeared.
  - (3) The changes brought about by thiamin deprivation may be due to a condition of the nerves rather than of the muscles--weak nerve stimulation. The nerve cell depends on glucose for energy and probably is the first of the body cells to suffer as a result of withdrawal of thiamin from the body.
- e. Efficiency of intestinal tract: Slides showing X-rays of stomach and intestines.
  - (1) Patients with lowered thiamin showed retention of food in the stomach and small bowel 6 hours after eating a "barium meal," whose position can be located with the X-ray.
  - (2) After restoration of thiamin to the diet, X-rays of similar meals after 6 hours showed little residue in the



stomach, little in the small intestine, and almost all in the large bowel.

f. Work (slides).

- (1) When thiamin was reduced the vigor of the patients was lessened, as shown by work accomplished at measured tasks.
- (2) On gradual restoration of thiamin to the diet, the women's vigor increased commensurately.
- (3) When a large excess of thiamin was given, the graphs showed that in terms of more vigorous work no benefit was gained from amounts beyond normal requirements.

4. Minerals.

a. Iron.

Lack of iron in the diet causes a type of anemia, which is easily corrected by using an abundance of garden truck, green leaves, and other green parts of the plant, beans, also liver and red meats. No need for farm families who can grow gardens to have anemia, of course.

b. Calcium.

- (1) Most people do not drink enough milk, the only really good source of calcium in the diet. Farm families in the Central States can, of course, have milk if they want it.
- (2) Skim milk, as far as calcium and protein are concerned, is as good as whole milk. Vitamin A can be put into skim milk and also into vegetable fats and oleo.
- (3) We need cheaper ways of distributing milk. Powdered milk is now so abundant that some is even being used in making paint and plastics.

IV. All possible ways of meeting the nutrition problem must be used, such as:

1. Home food production, where feasible.
2. Improving distribution and lessening costs.
3. Raising incomes of low-income families.
4. Improving the nutritive value of foods.



V. Flour.

1. Until the incomes of larger numbers of city families become higher, those in the lowest income brackets will have to get most of their food energy from white flour and sugar. The present per capita consumption of these two foods is  $6\frac{1}{2}$  ounces white flour and  $5\frac{1}{2}$  ounces sugar daily, totaling about 1,400 calories. Since Stiebeling's "food consumption unit" averages about 2,800 calories daily, the other 1,400 calories have to carry all the vitamins needed in the diet.
2. In 1840, in England, almost half of the calories in the diet came from flour. At that time, however, 100 pounds of wheat made 80 pounds of flour. By present milling methods we get 60 or at most 70 pounds of flour from 100 pounds of wheat.
3. At present, half of the wheat our grandfathers used has been replaced in our own diets by refined sugar which carries no vitamins and the rest has been robbed of its vitamins by the milling process.
4. In 1830, Sylvester Graham started his campaign for natural foods including flour ground from the entire wheat kernel, named Graham flour. Many of the so-called natural food faddists of the past made overclaims for these natural foods.
5. Research during the last 20 years has given us facts on which to talk nutrition really accurately.
6. "Don't blame the millers for taking advantage of the popular preference for a flour" which improved baking qualities, kept better, and did away with coarse bran that was harmful to many who had irritable digestive tracts.
7. Only 2 percent of the total flour production in the United States is in the form of whole-wheat flour today. In our present imperative need to improve the nutritional condition of our population, we can to some extent sidestep the need of education in regard to whole-wheat breads for low-income families by "enriching" the white flour so commonly used. This may be done in several ways, one of which is returning synthetic vitamins to patent flour after it has been milled.
8. Vitamin products are now quite cheap. Thiamin can be purchased in milligram lots at a low price per gram. Riboflavin is not available so cheaply at present, but the price is expected to fall rapidly. Nicotinic acid is very cheap. By the way, it is in name, and not at all in composition, that nicotinic acid resembles the poison nicotine present in tobacco. These three vitamins are all concerned with starch metabolism.



9. Another substance present in the natural wheat kernel is choline. We do not yet know how much of this choline to use, but it is not too expensive to be returned to flour if we choose to do so.

#### VI. Enriched Flour.

1. We need to do something about flour for people who can't afford to buy enough protective foods.
2. How the enriched-flour situation has come about.
  - a. In the fall of 1940 the Food and Drug Administration gave notice of hearings on definitions and standards for flour at which the industry and Government would be represented. It became apparent that when once such definitions and standards had been officially promulgated there would be no possibility of adding nutrients to flour or even of using a partial type of milling through the restoration of mill streams.
  - b. After several days of disagreement between the representatives of industry, Government, and nutrition research, the hearings were adjourned in order to give the parties interested an opportunity to come closer together. Shortly thereafter, on the suggestion of Director Wilson and Surgeon General Parran of the United States Public Health Service, a group of millers and bakers called a conference at Chicago to get millers and nutrition experts together on their recommendations and specifications for a flour which would more nearly approach the nutritional quality of whole wheat.
  - c. At this and following conferences it was decided that the millers should get back to an 85 percent extraction of the wheat kernel, at least as far as iron and the carbohydrate-burning vitamins are concerned (B<sub>1</sub>, riboflavin, and nicotinic acid), but that levels of calcium and vitamin D might remain optional. It was further decided that specified levels might be obtained either by (a) adding the foregoing substance to patent flour, with the exception of riboflavin which is not yet available in sufficient quantity; or (b) changing the processes of milling to retain the original substances in the wheat grain--at present such flours are not entirely white. These discussions received the endorsement of the committee on food and nutrition of the National Research Council.

#### VII. Specifications for Enriched Flour.

1. Although for lack of time official promulgation of specifications has not yet been made, the Food and Drug Administration has given assurances that the specifications for flour and bread, when issued, will follow closely the recommendations of the committee on food and nutrition of the National Research Council.

FLOUR

BREAD

Nutrients per pound of flour

Nutrients per pound of bread\*  
(Crust has less thiamin than crumb on account of cooking)

	Minimum	Maximum	Minimum	Maximum
Thiamin.....	1.66 mg.	2.46 mg.	1 mg.	2 mg.
Nicotinic acid..	6.15 mg.	10.0 mg.	4 mg.	8 mg.
Iron.....	6.15 mg.	24.6 mg.	4 mg.	16 mg.
Riboflavin.....	1.2 mg.	1.83 mg.	.8 mg.	1.6 mg.
(To be added as soon as procurement permits)				
Calcium.....	.5 gm.	2.0 gm.	.3 gm.	1.2 gm.
	(optional)		(300 mg. optional)	
Vitamin D.....	250 I.U.	1000 I.U.	150 I.U.	600 I.U.
			(optional)	

\*These allowances are based on the proportion of 1 pound of flour to 1½ pounds of bread. There is a 10 to 15 percent loss of thiamin in baking bread. This loss is greatest in the crust. The maximum levels for both flour and bread are set to discourage excessive additions. We don't want medicated foods. The enrichment recommended represents restoration in the direction of natural levels, not fortification.



Questions Asked Dr. Wilder

1. Does enriched bread have anything that whole wheat lacks?

Whole-wheat bread has all the B-complex such as B<sub>1</sub>, riboflavin, nicotinic acid, pyridoxine, pathothenic acid, B<sub>6</sub>, Vitamin E, Factor W, anti-gray hair factor, and wheat-germ oil. Some of these will be lacking in enriched flour, but in whole wheat flour we have some things we don't need, such as bran which prevents to some extent the absorption of needed vitamins.

2. What is the value of "cracked wheat flour"?

It has the value of whole wheat but is coarse and by some persons not well tolerated. Some so-called whole-wheat flour is just bran added to white flour.

3. What is the value of wheat-germ flour?

It is flour with germ retained; gives some elements of original grain but not enough of them. The bran contains much of the thiamin and iron.

4. Can one take too much Vitamin B<sub>1</sub>?

There is no evidence so far of any ill effects. However, it is not wise to glut oneself on vitamins from the drug store.

5. What is the relative value of Vitamin B<sub>1</sub> from natural sources as compared with synthetic thiamin chloride?

There is no difference.

6. What guide can be used to identify the new flour?

"Enriched flour" will be on the sack to indicate conformity to the accepted standard.

7. Will enriching bread increase its cost?

The additional cost of enriching flour at first will cost less than 50 cents a barrel or about 3 cents for a 24-pound sack by restoration. The bakers will probably absorb the small additional cost of 0.02 cents per loaf of bread.



